Two Scales, One Methodology - Expenditure Based Equivalence Scales for the United States and Germany

Joachim Merz and Thesia Garner and Timothy M. Smeeding and Jürgen Faik and David Johnson

Forschungsinstitut Freie Berufe (FFB)

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Abstract

Choosing an appropriate equivalence scale is a prerequisite for comparisons of economic well-being income distribution, inequality or poverty. This is true for country specific work or for cross-national comparisons. Researchers generally either use a country specific equivalence scale (social assistance, expert based, or poverty scales), or adopt a single scale for all comparison across countries. Here we follow a different approach. We use microdata to estimate equivalence scales based on a revealed preference consumption approach for West Germany and the United States. We review several approaches and rely on a complete demand system approach, which provides constant utility based equivalence scales using an extended linear expenditure system (ELES). The multiple equation expenditure system takes into account a full market basket with all its interdependencies and relative prices. Our consumption-based equivalence results are compared to alternative consumption based measures, expert based measures, and subjective based measures in use in both countries and to other scales used for cross-national comparisons.

JEL: I30, I32, D30, D31

Keywords: *alternative equivalence scale, Germany, USA, distribution of income, inequality, poverty*

Zusammenfassung

Die Wahl einer passenden Äquivalenzskala ist Voraussetzung für Vergleiche der Einkommensverteilung ökonomischer Wohlfahrt, Ungleichheit und Armut. Dies gilt vor allem für länderspezifische Analysen und/oder für länderübergreifende Vergleiche. Es werden von Forschern entweder eine jeweils landesspezifische Äquivalenzskala (Sozialhilfe, Experten basierte oder Armutsskalen) oder eine einzige Skala für einen mehrere Länder umfassenden Vergleich verwendet. Wir verfolgen hier einen unterschiedlichen Ansatz. Wir verwenden Mikrodaten um Äquivalenzskalen zu schätzen, die auf offenbarten Konsumpräferenzen für die alte Bundesrepublik und die Vereinigten Staaten basieren. Wir überprüfen verschiedene Ansätze und beziehen uns auf einen nachfragetheoretisch fundierten Systemansatz, der konstante nutzenbasierte Äquivalenzskalen über ein erweitertes lineares Ausgabensystem (ELES) liefert. Dieses multiple Ausgabegleichunmgssystem trägt einem vollen Warenkorb mit allen seinen Interdependenzen und relativen Preisen Rechnung. Unsere konsumbasierten Äquivalenzskalen werden mit alternativen Skalen, expertenbasierte und Skalen subjektiver individueller Einschätzung und anderen Skalen verglichen, die in beiden Ländern Verwendung finden und für länderübergreifende Vergleiche benutzt werden.

JEL: I30, I32, D30, D31

Schlagwörter: *Alternative Äquivalenzskalen, Deutschland, USA, Einkommensverteilung, Ungleichheit, Armut*

Cross-National Studies in Aging

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TWO SCALES, ONE METHODOLOGY—EXPENDITURE BASED EQUIVALENCE SCALES FOR THE UNITED STATES AND GERMANY

Introduction

Equivalence scales are used in measuring the economic resources (income, wealth) available to persons in households of different sizes and compositions. They are an integral part of most economic well-being comparisons involving income distribution, inequality and poverty. Buhmann, Rainwater, Schmaus, and Smeeding (1988), has shown that different national equivalence scales and approaches produce differences in the measurement of household needs, and also in intergroup and international comparisons of poverty and income position using different equivalence scales. Hence, the equivalence scale used can importantly affect the outcome of such studies.

This paper offers an alternative to the current set of equivalence scales by using microdata to estimate a set of equivalence scales based on revealed preference for West Germany and the United States, using the same methodology for each nation. Our paper is part of a joint United States and German research project to compare equivalence scales using consistent methods and similar microdata from the household expenditure surveys of both countries.

We review several approaches to estimating these equivalence scales, but rely on a complete demand system approach as specified by an extended linear expenditure system (ELES) to provide constant utility based equivalence scales. This multiple equation expenditure system takes into account a full market basket with all its interdependencies and relative prices.

For purposes of international comparison, most analysts rely on one equivalence scale, testing sensitivity of the basic results to the scale chosen (e.g., Förster, 1993). When two countries are used, for example the United States and Germany, analysts try to use each nation's own scale and test the sensitivity of the results by substituting one nation's scale for another's and vice versa a (e.g., Burkhauser, Duncan, and Hauser, 1991). We follow a different approach, one which considers both the economic and institutional differences of two nations. Employing one nation's scale on another nations people would ignore differences in the provision of "merit" goods, such as health care and education, across these two nations. Our one methodology approach explicitly allows for national differences in consumption weights and goods prices to affect the resultant scales. Moreover, comparisons of cross-national and intra-national income distributions are supported by a consistent methodological basis whereby adjustments for differences in consumption needs are determined by actual consumption patterns and not by expert judgements or by public opinion. We also compare the equivalence scales estimated here to different scales implicit in German and United States social policy toward the aged, in poverty measurement, and in other policy and program issues where household size adjustments are called into play.

Our project began with Merz and Faik's (1992) estimates of several types of consumption based equivalence scales for Germany. These were the first such scales ever estimated in Germany. A similar research approach was used by Phipps and Garner (1992) to compare the United States and Canada. The resulting equivalence scales were "indistinguishable statistically or practically" (Phipps and Garner, 1992, p. 18). However, the results of our analysis do produce different equivalence scales for both nations. After additional adjustments, at the suggestion of the American partners, we selected a set of methods, definitions and equations which were then re-estimated for both nations.

The paper is arranged as follows: the second section briefly embeds our approach within the general literature on equivalence scales. We then review revealed preference consumption expenditure-based equivalence scales and specify our Engel single equation expenditure approach and the ELES complete demand system approach. Next we describe the microdata bases, a sample of the most recently available West German Income and Consumption Survey (EVS) for 1983 and eventually the U.S. Consumer Expenditure Survey (CEX) for 1983. The empirical results are discussed and compared to other scales in the literature in the last section.

Equivalence Scales for Welfare Comparisons: Aim, General Approaches, and Issues

Equivalence scales deflate household income according to the household type to "calculate the relative amounts of money two different types of households require in order to reach the same standard of living" (Muellbauer, 1977, p. 460). Given equal preference or utility levels u for two households and constant prices (p), an equivalence scale (e) of a household with composition (a) relative to that of some reference household with composition (a_0) then is defined as

$$e = c(u,p,a)/c(u,p,a_0) = y/y_0, \tag{1}$$

where $c(.)$ is the cost function of reaching utility level u and y is the money income of the respective household.

Economies of scale and differences in individual needs by age suggest that a per capita measure of household income which gives equal weight to each person a crude equivalence scale. Unadjusted household income implicitly contains yet another type of scale—a zero adjustment for differences in household size and composition. A behavioral based approach to equivalence scales produce results which are more sensitive to such differences.

Equivalence approaches can be divided into three general categories: expert, subjective, and consumption based.[1] Expert based equivalence scales are defined by physiological and socio-cultural basic needs stated by some experts. Examples are "Zentimetergewichte" (height * weight) (Engel, 1895), physiological and further basic needs (Rowntree, 1901), or basic food expenditures (Orshansky, 1965). Subjective equivalence scales are based on individual surveys asking either for the minimum income needed by a typical household or for the minimum income for the respondent's own household (Kapteyn and van Praag, 1976; Kapteyn, Kooreman and Willemse, 1988; van Praag et al., 1982; deVos and Garner, 1991 are examples of these).

Consumption based equivalence scales rely on revealed preferences measuring actual consumption expenditures of different household types. Single consumption equation methods first dealt with either absolute expenditures with specific adult and children goods (Rothbarth, 1943) or budget shares (Engel, 1857) where the income relation y/y_0 is given by identical relative expenditures. Later, multiple consumption equation methods encompassing several goods to capture different economies of scale in different goods were developed (Prais and Houthakker, 1955, generalizing the Engel model).[2]

More recently, the complete demand system approach has been based on cost functions defined by microeconomic theory (and its duality assumptions) and incorporating the household allocation problem for a full market basket of expenditures (Barten, 1964; Gorman, 1976; van der Gaag and Smolensky, 1982). Though we ignore the issue here, recent research in this area has also addressed the issue of intra-household allocation of resources via a household production approach (Gronau, 1988).[3]

Revealed Preference Consumption Expenditure Based Equivalence Scales: Our Approach and Implicit Choices

In this paper we concentrate on one revealed preference consumption based method—the complete demand system ELES approach. As an expenditure based model this approach is behaviorally based and relies on actual expenditures of different household types to estimate an equivalence scale, rather than using physiologically based needs (e.g., minimum quantities of minerals or vitamins) or socially and politically determined "needs." We experimented with the Engle (1975) single equation approach because of its use as a traditional reference in practice but decided to rely on the more general ELES approach as argued by van der Gaag and Smolensky (1982) and Betson (1990).

The complete demand system approach is a more general approach than the Engel approach, taking into account the consumption of a full market basket satisfying individual needs and preferences in a closed demand system. With Lluch's (1973) Extended Linear Expenditure System (ELES) the demand system can be derived from maximization of a lifetime utility function under a lifetime wealth constraint (Kakwani, 1980).[4] The two period intertemporal utility maximization problem which yields the same results (van der Gaag and Smolensky, 1982) is

$$\begin{aligned} \max\ u &= \textstyle\sum_i \beta_i \log\left[(v_{1i}/m_i) - g_i\right] + (1+\delta)^{-1} \sum_i \delta_i \log\left[(v_{2i}/m_i) - g_i\right] \\ s.t.\ & \textstyle\sum_i v_{1i} + (1+\pi)^{-1} \sum_i v_{2i} = z \equiv wealth \end{aligned} \tag{3}$$

with $\sum_i \beta_i = 1$, $v_{it}/m_i > g_i$ (goods: $i = 1,...,n$; periods: $t = 1,2$), where v_{ti} = expenditure of good i in period t, δ = the subjective utility discount factor, π = interest rate, δ_i = marginal budget share, g_i = subsistence expenditures, and with m_i:

$$m_i = 1 + d_i'a \tag{4}$$

as commodity specific weighting factors yielding $m_i = 1$ for the reference household with $a=0$.

Constrained optimization yields the current period linear expenditure system:

$$\begin{aligned} v_i &= \alpha_i^0 + \beta_i^0 z + \alpha_i' a \quad resp. \\ v_i &= g_i + \alpha_i' a + \beta_i \mu (z - \textstyle\sum_j g_j) \qquad (i = 1,...,n), \end{aligned} \tag{5}$$

with $(z - \Sigma_j g_j)$ as supernumerary income and

$$\alpha_i^0 = g_i - \beta_i^0 \textstyle\sum_j g_j,$$

$$\beta_i^0 = \beta_i \mu, \; where \; \mu = [(1 + \delta)/(2 + \delta)](2 + \pi)(1 + \pi), \; and$$

$$\alpha_{iK} = g_i d_{ik} - \beta_i^0 \textstyle\sum_j g_j d_{jk}$$

as the elements of the household composition coefficients s-vector α_i, with goods i, $j = 1,...,n$ and household characteristics $k = 1,...,s$.

After estimation of α_i^0, β_i^0 and α_i with $\sum_i \beta_i^0 = \sum_i \beta_i \mu = \mu \sum_i \beta_i = \mu$ the structural coefficients β_i and g_i are given by

$$\begin{aligned} \beta_i &= \beta_i^0/\mu = \beta_i^0/\textstyle\sum_i \beta_i^0 \\ g_i &= \alpha_i^0 + \beta_i^0 \textstyle\sum_j g_j = \alpha_i^0 + \left[\beta_i^0/(1 - \mu)\right] \sum_j \alpha_j^0 \end{aligned} \tag{6}$$

The dual of the utility maximization problem with its Stone-Geary utility function yields the following cost function (Deaton and Muellbauer, 1980):

$$c(u,a) = \textstyle\sum_i g_i(1 + d_i'a) + \exp\left[u - \sum_i \beta_i \log \beta_i^0 + \sum_i \beta_i \log(1 + d_i'a)\right]. \tag{7}$$

Finally, the true, constant utility household equivalence scale with respect to differences in household composition is given as in (1) by the fraction of both households' cost functions $e = c(u,a)/c(u,a_0)$.

The structural influence of the household composition, given by the s-vectors d_i $(i = 1,...,n)$, which is important to calculate the utility level, the cost function value, and commodity specific weighting factors, can be derived via equation (6) by solving the linear expenditure system[5]

$$A_{(nn)}d_k = \alpha_k \text{ with } d_k = A^{-1}_{(nn)}\alpha_k, \qquad (k = 1,...,s),$$

with $A_{(ij)} = g_j(1 - \beta_i^0)$ for $i=j$ and $-\beta_i^0 g_j$ else; $d_k = (d_{1k},...,d_{nk})'$ and $\alpha_k = (\alpha_{1k},...,\alpha_{nk})'$.

To calculate ELES expenditure equivalence scales, three important questions concerning the underlying approach need be answered:

- Which basket of goods should we utilize?
- How should we incorporate household composition?
- Which resource or budget constraint measure should be used?

Which Good, or Which Basket of Goods? Traditionally, food is the central category fulfilling the most basic needs. Our food category comprises basic food, semi-luxury food and meals out of home. Many equivalence scales implicitly presented in Social Assistance stipends and other similar minimum consumption standards programs are based on a basket of goods. We considered two baskets of goods: food, clothing, and shoes, and housing and energy (goods basket I) and goods basket I plus body and health care (goods basket II), to describe basic standard of living for expenditures in industrialized countries. We selected goods basket II for our modeling. Food policy and goods basket I results are available from the authors upon request.

How Should We Incorporate Household Composition? In bringing demographics into the ELES model, we follow the Barten (1964) approach using a linear combination of household composition dummies, a procedure which is comparable to the van der Gaag and Smolensky (1982), United States approach.[6] Here we can either specify a separate household type and give each a dummy (i.e., two adults, one child household, etc.), or we can combine a more or less homogeneous group (like the number of persons in age groups) to form a polytomeous dummy variable. We follow the second approach in our model.[7]

Which Resource or Budget Constraint Measure Should be Used? As mentioned above, the budget constraint regressor might be either total expenditures or some measure of household income capturing saving and dissaving processes. Our analysis will show the results for both resource measures. The question of a permanent income measure to better capture the durable expenditure problem will be discussed within the complete demand system.

Microdata: West German Income and Consumption Survey 1983 and the United States Consumer Expenditure Survey 1986-87

Two databases were used to estimate our equivalence scales, the West German Income and Consumption Survey (Einkommens- und Verbrauchsstichprobe, EVS) and the United States Consumer Expenditure Survey (CEX). The project staff identified a common set of variables and aggregation of variables for the purpose of estimating this set of equivalence scales.

West German Income and Consumption Survey 1983

The most recently available and extensive cross-section microdata base for household economic research in Germany is the Income and Consumption Survey (1983). Information about this survey of more than 44,000 households (all persons living together regardless of

marriage or birth status), with detailed expenditure and income microdata, is summarized in Table 1A. To protect respondents' privacy an anonymized 96 percent random sample of the original EVS (1983) was made available to us for our analysis, reducing our sample to 42,752 units. This sample, was provided by the Sonderforschungsbereich 3 "Microanalytic Foundations of Social Policy" at the Universities of Frankfurt and Mannheim, financed by the German National Science Foundation.[8]

Our sample is restricted to German-headed households of four than seven members. Household information consists of household characteristics, income, transfer and tax information of a variety of sources. Consumption expenditures are aggregated into 20 categories. Additionally, socio-demographic information about each person in every household was also used. Variable definitions are presented in Table 2A.

United States Consumer Expenditure Survey

A basic description of the United States Consumer Expenditure Survey (CEX) data which underlies this report is contained in Table 1B. This survey is used to compute the United States consumer price index and to collect statistics on expenditures by various household units. The sample used for this study was restricted to consumer units participating in four complete interviews (or interviews 2-5) in 1986-87. The sample included 5,073 consumer units. This sample was reduced to 4,972 consumer units when restricted to units with fewer than seven persons. For the analysis in which income was used as an explanatory variable, the sample was further reduced to 4,323 by restricting it in order to calculate the ELES system (see Garner and Blanciforti, 1992, for further information). Variable definitions are given in Table 2B.

TABLE 1A

WEST GERMANY'S INCOME AND CONSUMPTION SURVEY
(EINKOMMENS- UND VERBRAUCHSSTICHPROBE, EVS) 1983

Legal basis:

Federal statistic: Bundesstatistik-Gesetz (BStatG) 14.März 1980: 1962/63, 1969, 1973, 1978, 1983 (1988).

Sample:

Quota sample with voluntary participation (Euler, 1982).

Observations: 0.2 percent of all private households in West Germany (ca. 50,000 households (gross)), 44,507 households finally to analyze, reduced by 4 percent to 42,752 for our purposes.

Not included: households of foreigners, households in institutions, households with a monthly net household income $\geq$ 250,000 DM. Remaining households represent ca. 92 percent of all West German households.

Number of variables per household: 548.

Questionnaires/Methods:

First interview (Grundinterview) January 1983:

Sociodemographics, durables available

Over the year bookkeeping (Haushaltungsbücher):

Monthly (for 11 months) information (laufende Monatsanschreibungen): one figure for an entire respective month (gathered in a four month booklet (Vierteljahresheft)):

- all income figures
- important expenditures

One month of daily information (Feinanschreibung) by a stratified rotation procedure: daily information:

- detailed smaller private consumption expenditures (open question)
- food and semi-luxury expenditures (open question)

Final interview (Schlußinterview) January 1984: Wealth (selected items) and savings.

Further Information:

Euler, M. 1982. Einkommens- und Verbrauchsstichprobe (EVS) 1983, in: Wirtschaft und Statistik 6/1982, pp. 433-37.

Statistisches Bundesamt (1984 and various years), Fachserie 15, Wirtschaftsrechnungen, Einkommens- und Verbrauchsstichproben, Heft 7, Aufgaben, Methode und Durchführung, Stuttgart und Mainz.

Wirtschaft und Statistikl (WiSta), various years.

TABLE 1B

UNITED STATES CONSUMER EXPENDITURE SURVEY INTERVIEW, 1986-87

Legal Basis and Justification for the Consumer Expenditure Survey (Interview and Diary):

- To produce weights for the Consumer Price Index and to present statistics on the spending of consumer units.

Survey Sample:

- National probability sample, stratified by primary sampling units (PSU's) that consist of counties (or parts thereof), groups of counties, or independent cities.
- The sample of households is designed to represent the civilian noninstitutional population and a portion of the institutional population living in grouped quarters, including college and university housing, living in the four Census regions of the United States.
- The sample size is targeted at approximately 5,000 interviews per quarter or every three months.
- About 86 percent of the eligible sample units participated in an interview during the period for this study.
- The design is such that each consumer unit is to be interviewed once per quarter for five consecutive quarters, and then rotated out of the sample.

Questionnaire/Method:

- During the initial personal interview, information is collected on demographic and family characteristics and on the inventory of major durable goods of each consumer unit.
- The second through fifth interviews use uniform questionnaires to collect household and member information and expenditure data for the previous three months in general.
- Detailed income data, such as wage and salary earnings, unemployment compensation, child support and alimony, and employment information on each household member, are also obtained in the second and fifth interviews. Asset and liability data are also collected in the fifth interview. Ninety to 95 percent of total consumer expenditures are collected using the Interview (USDL, 1990).

Further Information:

Garner, T. and Blanciforti, L. 1992. "Household Income Report Completeness: An Analysis of U.S. Consumer Expenditure Survey Data," *ASA Proceedings of the Section on Economic and Business Statistics 1991, Atlanta, GA.* Alexandria, VA: American Statistical Association.

U.S. Department of Labor, Bureau of Labor Statistics, 1990. *Consumer Expenditure Survey, 1987,* Bulletin 2354. Washington, DC: U.S. Government Printing Office, June.

TABLE 2A

LIST OF EXPENDITURE ITEMS USED IN THE 1983 GERMAN CONSUMPTION SURVEY

FOOD

a. basic food

- meat, fish, etc.
- milk, etc., eggs, edible fat, salad-oil
- fruit, etc. (without beverages and jam)
- potatoes, vegetable, etc. (without beverages)
- bread and other baker's wares
- sugar, sweets, etc.
- other basic food (e.g., baby food)

b. semi-luxury

- beverages, tobacco goods

c. meals out of home

- meals and beverages in canteens, restaurants, etc., including during vacation

CLOTHING AND SHOES

- men's, women's, boys', girls' clothing and footwear

HOUSING AND ENERGY

- rent of flats
- subcontract rent
- computed rent value (own-used flat)
- electricity, fuel, etc.

TRANSPORTATION AND COMMUNICATION

- (new and used) cars, bicycles, motorcycles, etc.
- foreign repairs of cars, etc.
- accessories, e.g., for bicycles
- rent of garages
- costs of journeys (without lump sum journeys)
- telephone charges
- charges for letters, etc.

BODY AND HEALTH CARE

- consumption goods, etc., for health care
- medical and dental services, etc.
- expenditures for care of the skin, hair, etc.
- consumption goods and services, etc., for body care.

EDUCATION AND ENTERTAINMENT

- TVs, radios, etc. (including accessories and charges)
- cameras, etc. (including accessories)
- typewriters, computers, etc.
- musical instruments
- toys, sports goods
- books, newspapers, etc.
- cultural activities
- expenditures for plants, animals, etc.

PERSONAL BELONGINGS AND OTHER GOODS AND SERVICES

- furniture, carpenters, etc.
- cooking-ranges, refrigerators, washing machines, etc.
- washing material
- clocks, watches, jewelry, etc.
- bags
- articles for a burial
- lump sum journeys, including overnight stay
- services of banks
- other services

SOURCE: Statistisches Bundesamt 1983.

TABLE 2B

LIST OF EXPENDITURE ITEMS USED IN THE 1986 UNITED STATES CONSUMER EXPENDITURE SURVEY

FOOD
- food at home, including alcoholic and nonalcoholic beverages
- food away from home
- tobacco and tobacco products
- catered and on out of town trips

CLOTHING AND SHOES
- women's, girls', men's, boys' infants' clothing and footwear

TRANSPORTATION AND COMMUNICATION
- purchase of new and used cars, trucks, other vehicles net of trade-in; purchase of new aircraft
- vehicle associated costs like gasoline, collant, additives, brake fluids, tires, etc.
- vehicle insurance
- vehicle finance charges
- state and local vehicle registration, drivers' license, vehicle inspection
- parking fees, towing, tolls, etc.
- telephone services

BODY AND HEALTH CARE
- health insurance
- medical goods and services-general (including equipment, hospitals, dental services, etc.)
- prescription drugs
- eyeglasses or contact lenses, eyecare services
- care in convalescent or nursing home
- electrical personal care applicances, personal care services including haircuts, etc.

EDUCATION AND ENTERTAINMENT
- video casset recorders (VCRs), radios, stereo and related equipment, records, disks, tapes
- purchase, rental and repair of TVs, VCTs, radios, stereo, computers and related equipment
- community antenna and cable service
- school books and supplies for college, elementary and high school, day care and other
- newspapers, magazines, periodicals
- elementary, high school, college, and other tuition, including day care expenses
- boats, campers, purchase and rental
- recreational equipment and expenses
- clubs and fees of participant sports, entertainment admission fees, fees for recreational lessons

HOUSING AND ENERGY
- rent of dwelling
- rental equivalence of owned home
- household fuels
- trash and garbage pickup
- water and sewage treatment
- trash and septic tank-vacation home

PERSONAL BELONGINGS AND OTHER GOODS AND SERVICES
- apparel laundry, dry cleaning, storage of clothing
- watches, jewelry and their repair, luggage
- linens, furniture, appliances
- rugs, clocks, and household furnishings
- lodging away from home
- mortgage interest on owned vacation home
- public transportation
- babysitting
- housekeeping, gardening, other laundry services
- miscellaneous home services such as rentals
- legal fees, accounting, safety deposit boxes and other finance charges
- occupational expenses
- cash contributions of other consumer units and
- cash contributions to charities

Empirical Results

We begin with basic comparative statistics describing each sample used in our analysis. Regression and equivalence scale results follow. Finally, our results are compared to other commonly used equivalence scales in both nations.

German Microdata Descriptive Measures

Descriptive information based on weighted individual data representing a total population of 23.5 million households in West Germany (1983) is given in Table 2A for seven aggregated consumption expenditure categories: food, clothing and shoes, housing and energy, transportation and communication, body and health care, education and entertainment, and personal belongings and other goods and services (our goods basket) period. Table 3A gives figures for these categories plus household net income and a computed remainder (household net income minus private consumption). As shown in Table 3A, housing and energy (19.6 percent) and food (18.6 percent) amount for the largest shares of income with body and health care (3.6 percent) the smallest share of income. The variance, measured by the coefficient of variation, is highest within body and health care, the category with the lowest average expenditures.

It should be noted that Table 3A only comprises households with positive values for income. It includes 22 percent (100—33,146/42,745) of households with a negative remainder, indicating some dissaving or use of credit. Table 4A presents descriptive measures for the household types we use in our regression analyses. The breakdowns encompass single persons and married couples with and without children. A distribution of units by household size is also presented.

TABLE 3A

DESCRIPTIVE MEASURES OF EXPENDITURE CATEGORIES IN THE 1983 GERMAN CONSUMPTION SURVEY
(deutsch marks)

Expenditues	Mean	Percent of Household Income	Standard Deviation	Standard Deviation /Mean	Median	Min	Max	Skewness	Kurtosis	Non-positive (percent)
Food	7,407.65	18.62	4,287.45	0.579	6,993.47	0.00	94,550.00	1.604	10.856	0.07
Clothing and shoes	2,533.19	6.37	2,222.86	0.878	2,834.61	0.00	29,200.00	2.040	7.388	0.73
Housing and energy	7,793.98	19.59	3,623.68	0.465	7,556.63	300.00	44,450.00	1.117	2.782	0.00
Transportation & communication	5,076.67	12.76	6,463.96	1.273	3,512.77	0.00	102,150.00	3.153	15.238	0.65
Body and health care	1,352.82	3.40	2,403.18	1.776	2,609.89	0.00	80,650.00	9.004	154.582	3.98
Education and entertainment	2,960.48	7.44	3,095.62	1.046	2,980.70	0.00	107,600.00	5.534	98.639	0.02
Other goods and services	4,376.24	11.00	4,885.86	1.116	3,558.57	0.00	113,000.00	3.544	24.883	0.44
Remainder	8,289.47	20.83	16,406.76	1.979	5,461.65	-144,900.00	244,600.00	3.233	27.253	22.46
Goods basket	19,087.64	47.97	9,098.59	0.477	17,916.70	1,700.00	107,950.00	1.097	2.845	0.00
Private consumption	31,501.03	79.17	17,600.45	0.559	28,449.57	3,150.00	230,850.00	1.313	3.465	0.00
Household net income	39,790.50	100.00	25,700.16	0.646	34,953.25	800.00	325,350.00	2.179	10.401	0.00

Remarks: only cases where household net income > 0 using weighted data.
Legend: Mean = average expenditures; percent = budget shares; remainder = household net income minus all expenditures v_i (i=1,...,7).

TABLE 3B

DESCRIPTIVE MEASURES OF EXPENDITURE AND INCOME CATEGORIES IN THE 1986 UNITED STATES CONSUMER EXPENDITURE SURVEY
(in dollars)

Expenditues	Mean	Percent	Standard Deviation	Standard Deviation /Mean	Median	Min	Max	Skewness	Kurtosis	Non-positive (percent)
Food	3,939.95	15.64	2,443.00	0.620	3,564.00	30.00	28,294.00	1.719	7.297	0.00
Clothing and shoes	930.56	3.69	1,059.12	1.138	638.65	0.00	11,055.26	3.282	17.891	3.28
Housing and energy	6,601.55	26.20	4,208.08	0.637	5,954.45	0.00	73,890.94	3.242	28.709	0.07
Transportation and communication	5,012.23	19.89	5,851.52	1.167	2,922.00	0.00	44,349.09	2.189	5.659	0.30
Body and health care	1,412.54	5.61	1,845.59	1.307	1,028.40	-4,313.00	45,268.00	9.042	159.849	1.02
Education and entertainment	1,661.63	6.59	2,542.61	1.530	981.00	0.00	72,637.00	7.490	129.725	1.71
Other goods and services	2,955.46	11.73	3,823.80	1.294	1,933.15	0.00	96,874.43	6.186	93.075	0.62
Remainder	2,684.01	10.65	19,598.91	7.302	692.66	-98,490.98	794,837.19	14.924	505.420	46.43
Basket I	11,472.06	45.53	6,544.87	0.571	10,496.60	769.00	88,910.43	2.119	11.154	0.00
Basket II	12,884.60	51.13	7,182.09	0.557	11,908.30	932.24	92,132.43	2.014	9.749	0.00
Household net income	25,197.94	100.00	25,277.75	1.003	20,283.30	50.75	897,313.00	10.447	280.222	0.00
Total Expenditures	22,513.92	89.35	14,864.48	0.660	19,572.40	1,721.00	159,941.68	1.976	7.781	0.00

Remarks: Only cases where consumer unit net income > 0, expenditures 1-7 > 0, consumer units are complete income reporters as defined by BLS, and consumer units participate in the survey interview quarters 2-5. Mean, standard deviation and S/mean are based on weighted sample. All categories are based on total sample of 4,323 representing a population of 69,545,216. Percent of households with negative or zero expenditures given in last column.

Legend: Mean = average expenditures; percent = budget shares; remainder = household net income minus all expenditures v_i (i=1,...,7).

TABLE 4A

DESCRIPTIVE MEASURES OF HOUSEHOLD COMPOSITION IN THE 1983 GERMAN CONSUMPTION SURVEY

Household Type	Sample			Population		
	Number of Households	Percent of Persons	Percent of Households	Number of Households	Percent of Persons	Percent of Households
Singles						
1. all	7,574	17.72	99.66	7.41594e6	31.59	99.64
2. males, aged 18 to 64	4,702	11.00	61.87	3.86477e6	16.47	51.93
3. females, aged 65 or over	2,872	6.72	37.79	3.55114e6	15.13	47.71
Single Parent, aged 18 to 64						
4. and 1 child	497	1.16	3.97	309,630	1.32	4.31
5. and 1 child, aged 0 to 6	112	0.26	0.89	80,583	0.34	1.12
6. and 1 child, aged 7 to 17	385	0.90	3.07	229,047	0.98	3.19
7. and 2 children	183	0.43	1.96	99,651	0.42	2.40
Married couples						
8. both aged 18 to 65 or over	10,419	24.37	83.16	5.97656e6	25.46	83.24
9. both aged 18 to 64	6,424	15.03	51.27	3.48383e6	14.84	48.52
10. both aged 65 or over	2,382	5.57	19.01	1.60179e6	6.82	22.31
11. one aged 18 to 64 / one aged 65 or over	1,613	3.77	12.87	891,026	3.80	12.41
12. and 1 child	5,531	12.94	59.22	1.33976e6	9.97	56.41
13. and 1 child, aged 0 to 6	2,653	6.21	28.40	1.12886e6	4.81	27.22
14. and 1 child, aged 7 to 17	2,878	6.73	30.81	1.21092e6	5.16	29.20
15. and 2 children	5,876	13.74	61.98	1.90751e6	8.13	58.60
16. and 3 children	1,329	3.11	43.59	448,031	1.91	39.40
17. and 4 children	202	0.47	26.79	73,619	0.31	23.78

TABLE 4A (CONT.)

Household Type	Sample			Population		
	Number of Households	Percent of Persons	Percent of Households	Number of Households	Percent of Persons	Percent of Households
Household Size						
18. 1 person	7,600	17.78	100.00	7.44294e6	31.71	100.00
19. 2 persons	12,529	29.31	100.00	7.18014e6	30.59	100.00
20. 3 persons	9,340	21.85	100.00	4.14749e6	17.67	100.00
21. 4 persons	9,480	22.17	100.00	3.25495e6	13.87	100.00
22. 5 persons	3,049	7.13	100.00	1.13701e6	4.84	100.00
23. 6 persons	754	1.76	100.00	309,642	1.32	100.00
Adults						
aged 18 to 65 or over	88,869	75.08	100.50	4.38163e7	79.95	100.00
aged 18 to 64	77,833	65.76	87.58	3.52239e7	64.27	80.39
aged 65 or over	11,036	9.32	12.42	8.59418e6	15.68	19.61
Children						
aged 0 to 17	29,498	24.92	100.00	1.09870e7	20.05	100.00
aged 0 to 6	10,740	9.07	36.41	3.94458e6	7.20	35.90
aged 7 to 17	18,758	15.85	63.59	7.04269e6	12.85	64.10
All Persons	118,367	100.00	---	5.48033e7	100.00	---

Remarks: Percent of all households (42,752 respectively 23.5 million householdsl); percent of respective households with equal household size; e6 = 10^6; percent of all persons (118,367 respectively 5.48033e7 persons); percent of all adults and all children, respectively.

TABLE 4B

DESCRIPTIVE MEASURES OF HOUSEHOLD COMPOSITION IN THE 1986 UNITED STATES CONSUMER EXPENDITURE SURVEY

Household Type	Sample			Population		
	Number of Households	Percent of Persons	Percent of Households	Number of Households	Percent of Persons	Percent of Households
Singles						
1. all	1,071	24.77	100.00	17,367,574	24.97	100.00
2. males, aged 18 to 64	615	14.23	57.42	9,613,607	13.82	55.35
3. females, aged 65 or over	456	10.55	42.58	7,753,968	11.15	44.65
Single Parent, aged 18 to 64						
4. and 1 child	97	2.24	7.54	1,626,684	2.34	7.46
5. and 1 child, aged 0 to 6	26	0.60	2.02	475,543	0.68	2.04
6. and 1 child, aged 7 to 17	71	1.64	5.52	1,151,141	1.66	5.28
7. and 2 children	82	1.90	10.59	1,425,646	2.05	11.58
Married couples						
8. both aged 18 to 65 or over	961	22.23	74.67	16,341,054	23.50	74.99
9. both aged 18 to 64	573	13.25	44.52	9,640,367	13.86	44.24
10. both aged 65 or over	276	6.38	21.45	4,785,127	6.88	21.96
11. one aged 18 to 64 / one aged 65 or over	112	2.59	8.70	2,625,739	3.78	12.05
12. and 1 child	334	7.73	43.15	5,426,280	7.80	44.09
13. and 1 child, aged 0 to 6	169	3.91	21.83	2,808,559	4.04	22.82
14. and 1 child, aged 7 to 17	165	3.82	21.32	2,617,720	3.76	21.27
15. and 2 children	399	9.23	56.60	6,240,610	8.97	56.69
16. and 3 children	195	4.51	54.30	2,877,207	4.14	54.13
17. and 4 children	44	1.02	33.59	612,879	0.88	34.92

TABLE 4B (CONT.)

Household Type	Sample			Population		
	Number of Households	Percent of Persons	Percent of Households	Number of Households	Percent of Persons	Percent of Households
Household Size						
18. 1 person	1,071	24.77	100.00	17,367,574	24.97	100.00
19. 2 persons	1,287	29.77	100.00	21,791,201	31.33	100.00
20. 3 persons	774	17.90	100.00	12,306,976	17.70	100.00
21. 4 persons	705	16.31	100.00	11,008,898	15.83	100.00
22. 5 persons	355	8.21	100.00	5,315,534	7.64	100.00
23. 6 persons	131	3.03	100.00	1,755,033	2.52	100.00
Adults						
aged 18 to 65 or over	8,346	73.55	100.00	132,890,105	74.23	100.00
aged 18 to 64	6,820	60.10	81.72	107,091,812	59.82	80.59
aged 65 or over	1,526	13.45	18.28	25,798,293	14.41	19.41
Children						
aged 0 to 17	3,002	26.45	100.00	46,124,258	25.77	100.00
aged 0 to 6	1,114	9.82	37.11	17,744,474	9.91	38.47
aged 7 to 17	1,888	16.64	62.89	28,379,784	15.85	61.53
All Persons	11,348	100.00	---	179,014,363	100.00	---

Remarks: Percent of <u>all</u> households (42,752 respectively 23.5 million householdsl); percent of respective households with equal household size; e6 = 10^6; percent of <u>all</u> persons (118,367 respectively 5.48033e7 persons); percent of all adults and all children, respectively. Percent of all households used in analysis (43.23 representing 69,545,216 total units).

United States Microdata Descriptive Measures

Information presented here is based on approximately 69.55 million United States consumer units in 1986-1987 with four interviews in Tables 3B and 4B closely paralleling the German descriptions in Tables 3A and 4A. The same seven aggregate data categories available for Germany have been replicated in the United States by aggregation of the more detailed United States expenditure categories (see Table 2B). Weighted mean total consumption expenditures in the United States in 1986-87 equal $23,301. Consumer unit weighted mean net income (income before taxes minus income and all property taxes and payments for Social Security and Railroad Retirement) is $26,180 (Table 3B). Housing and energy account for the largest percentage of income share (25.78 percent). Transportation and communication follow with 20 percent. Food comes in third at 15.5 percent. The smallest income share is allocated to clothing and shoes (3.75 percent) (Table 3B).

The weighted sample is composed mostly of married couple consumer units (60.7 percent) while singles represent 23.3 percent of the total sample. Elderly single persons represent 9.34 percent, while married couples, with both persons aged 65 or older, represent 7.8 percent. Married couples, with both persons aged 18 to 64 years with one to four children represent approximately 41 percent of the sample (Table 4B).

ELES Complete Demand System Approach

The full market basket in our ELES estimates encompasses seven expenditure categories: food, clothing and shoes, housing and energy, transportation and communication, body and health care, education and entertainment, and personal belongings and other goods and services. By the Statistical Office's definition in Germany, these expenditures describe private consumption; similar construction was made for the United States.

In the theoretical approach with equation (3), the income measure is intertemporal wealth, z, incorporating saving and dissaving processes. Our proxy, household net income (rather than total expenditures = personal consumption) is incorporated in the estimates which follow.

The ELES complete demand system reduced form coefficients, as in equations (3) through (7), were estimated equation by equation using OLS following the Zellner (1962) seemingly unrelated regression approach.[9] These results are shown in Tables 5A and 5B and 6A and 6B. The goodness-of-fit measured by the adjusted R^2 shows a range from 8 percent (body and health care) to housing and energy (46 percent), which is quite good for a cross section analysis. The seven categories encompass private consumption expenditures with a total marginal propensity to consumer $\sum_i b_i = 0.46$ indicating a high remainder marginal propensity to consume. Since the remainder captures—besides saving and dissaving—a variety of other expenditures[10] and the so-called "statistical difference" (survey errors concerning total expenditure minus income), a relatively high remainder value is plausible.

The ELES equivalence scales depend on a selected income level of the reference household type $[z \rightarrow v_i \rightarrow u \rightarrow c(.)]$.[11] It is an empirical question whether the scale is positively or negatively correlated with the income level because the ELES full market basket approach includes both basic goods (with an income elasticity normally < 1) which have an opposite effect. Thus, the empirical results in Tables 7A and 7B contain differential effects according to different income levels.

Despite wide income ranges used, from subsistence to 1.5 times the median, the corresponding equivalence scales do not vary greatly by income level. This result corresponds with the findings of van der Gaag and Smolensky (1982) based on the U.S. Consumer Expenditure Survey 1972/73 and with the United States results given in Table 7B. Differences

TABLE 5A

GERMANY ELES: REGRESSION RESULTS ACCORDING TO SOCIODEMOGRAPHIC VARIABLES

Expenditure Category	OLS Parameters							R^2
	a	b	c_1	c_2	c_3	c_4	c_5	
Food	1,874.126	0.052	36.406*	951.087	1,489.878	1,160.554	1,020.596	0.386
Clothing and shoes	528.963	0.042	-163.700	214.425	202.843	-77.277+	167.526	0.285
Housing and energy	3,163.374	0.081	731.327	771.158	577.949	724.564	37.043*	0.455
Transportation and communication	797.649	0.093	-78.658*	-221.692	572.515	-785.277	413.006	0.160
Body and health care	281.848	0.034	262.974	-43.807*	-174.425	93.548+	218.454	0.076
Education and entertainment	1,000.914	0.059	153.282	274.512	-80.440+	-490.151	-63.089*	0.196
Other goods and services	1,210.206	0.101	-521.295	-339.497	-461.801	-471.898	643.002	0.200

Remarks: (1) + not significant at the 0.1 percent level; * not significant at the 1 percent level; all other parameters are significant at the 0.1 percent level.
(2) sample size: n = 42,745 (net income > 0; expenditures not restricted).

Legend:. a = constant; b = net income; number of persons in age classes: c_1 (aged 0-6), c_2 (aged 7-17), c_3 (aged 18-64), c_4 (aged 65+); c_5 = family status of household head ($\geq$ 18 years; married = 1, nonmarried = 0).

TABLE 5B

UNITED STATES ELES: REGRESSION RESULTS ACCÓRDING TO SOCIODEMOGRAPHIC VARIABLES

Expenditure Category	OLS Parameters							Adj. R^2
	a	b	c_1	c_2	c_3	c_4	c_5	
Food	1,154.49	0.035	-53.36^{+}	520.51	766.76	385.98	680.14	.449
Clothing and shoes	184.84	0.017	9.09^{+}	157.62	152.27	-36.65^{+}	64.95^{+++}	.275
Housing and energy	3,509.39	0.074	-139.87^{+}	155.49^{++}	405.32	539.71	827.84	.288
Transportation and communication	852.77	0.055	-377.66^{+}	112.90^{+}	1,362.33	45.01^{+}	1,179.20	.203
Body and health care	409.76	0.010	-44.38^{+}	29.34^{+}	164.65	747.20	345.76	.097
Education and entertainment	308.75	0.036	49.76^{+}	190.13	148.33^{++}	-250.89^{++}	454.02	.199
Other goods and services	833.53	0.070	-15.46^{+}	-77.45^{+}	41.12^{+}	77.81^{+}	508.74	.252

Remarks: (1) + not significant at the 0.1 percent level; ++significant at .05 level; +++ significant at .10 level; all other parameters significant at .001 level. (2) sample size: n = 4,323 (net income > 0; expenditures not restricted).

Legend: a = constant; b = net income; number of persons in age classes: c_1 (aged 0-6), c_2 (aged 7-17), c_3 (aged 18-64), c_4 (aged 65+); c_5 = family status of household head (≥ 18 years; married = 1, nonmarried = 0).

TABLE 6A

GERMANY ELES: REGRESSION RESULTS ACCORDING TO HOUSEHOLD SIZE

Expenditure Category	OLS Parameters							R^2
	a	b	c_1	c_2	c_3	c_4	c_5	
Food	2,895.300	0.059	2,370.402	3,473.498	4,221.367	5,162.813	5,937.595	0.365
Clothing and shoes	549.485	0.044	268.335	505.348	717.076	716.480	573.637	0.275
Housing and energy	3,759.605	0.079	732.628	1,534.393	2,095.531	2,710.417	3,285.845	0.454
Transportation and communication	536.352	0.099	826.912	1,525.575	1,478.343	1,398.042	1,109.114	0.149
Body and health care	286.838	0.032	58.259*	-83.231*	62.336*	-16.408*	-322.157+	0.069
Education and entertainment	723.237	0.058	-84.635*	182.398	409.590	453.955	270.713*	0.189
Other goods and services	616.185	0.101	306.345	-213.830+	-555.749	-961.142	-1,545.565	0.200

Remarks: (1) + not significant at the 0.1 percent level; * not significant at the 1 percent level; all other parameters are significant at the 0.1 percent level. (2) sample size: n = 42,745 (net income > 0; expenditures not restricted).

Legend: a = constant; b = net income; number of persons in age classes: $c_1,...,c_5$: 2,...,6 persons (as 0/1 dummies).

TABLE 6B

UNITED STATES ELES: REGRESSION RESULTS ACCORDING TO HOUSEHOLD SIZE

Expenditure Category	OLS Parameters							Adj. R^2
	a	b	c_1	c_2	c_3	c_4	c_5	
Food	1,716.890	0.040	1,033.552	1,702.495	2,206.106	2,594.110	3,014.980	0.410
Clothing and shoes	262.316	0.018	96.075^{++}	307.270	506.446	610.111	551.756	0.263
Housing and energy	3,881.633	0.077	1,063.808	1,148.046	1,463.440	1,370.837	1,313.250	0.280
Transportation and communication	1,550.050	0.066	1,500.583	2,761.367	3,254.873	3,014.674	3,472.505	0.168
Body and health care	848.838	0.010	475.737	313.509	345.532	423.165	335.442^{++}	0.038
Education and entertainment	315.460	0.038	172.379^{+++}	705.790	933.714	1,107.180	596.053^{++}	0.191
Other goods and services	891.964	0.072	290.279^{++}	490.853^{++}	396.217^{++}	254.020^{+}	123.552^{+}	0.249

Remarks: (1) + not significant at the 0.1 percent level;++significant at .05 level;+++ significant at .10 level; all other parameters significant at .001 level.
(2) sample size: n = 4,323 (net income > 0; expenditures not restricted).

Legend: a = constant; b = net income; number of persons in age classes: c_1 (aged 0-6), c_2 (aged 7-17), c_3 (aged 18-64), c_4 (aged 65+); c_5 = family status of household head ($\geq$ 18 years; married = 1, nonmarried = 0).

TABLE 7A

ELES: EQUIVALENCE SCALES FOR GERMANY

Household Type	Reference Income Level (in DM)				
	Subsistence[a]	Lower[b] 20,101.35	Median 22,757.11	Mean 24,941.21	Upper[c] 34,135.67
Single					
1. all	100.00	100.00	100.00	100.00	100.00
2. aged 18 to 64	102.77	102.85	102.89	102.92	103.00
3. aged 65 or over	80.49	79.03	78.25	77.74	76.29
Single Parent, Aged 18 to 64					
4. and 1 child	116.03	115.49	115.21	115.02	114.49
5. and 1 child, aged 0 to 6	107.51	107.10	106.88	106.83	106.32
6. and 1 child, aged 7 to 17	120.90	120.22	119.86	119.62	118.96
7. and 2 children	129.29	127.92	127.21	126.73	125.39
Married Couples					
8. all	148.75	148.19	147.90	147.70	147.15
9. both aged 18 to 64	154.28	153.83	153.59	153.43	152.98
10. both aged 65 or over	109.74	106.22	104.35	103.12	99.66
11. one aged 18 to 64/one aged 65 or over	132.01	130.83	130.20	129.79	128.62
Married Couple, Both Aged 18 to 64					
12. and 1 child	167.54	166.51	165.97	165.61	164.59
13. and 1 child, aged 0 to 6	159.03	158.22	157.79	157.50	156.70
14. and 1 child, aged 7 to 17	172.42	171.22	170.58	170.16	168.98
15. and 2 children	180.80	179.04	178.11	177.49	175.75
16. and 3 children	194.06	191.42	190.03	189.10	186.51
17. and 4 children	207.32	203.68	201.75	200.47	196.89
18. 1 person	100.00	100.00	100.00	100.00	100.00
19. 2 persons	147.81	147.83	147.85	147.86	147.90
20. 3 persons	173.92	173.64	173.40	173.23	172.77
21. 4 persons	189.98	189.43	188.94	188.61	187.70
22. 5 persons	201.04	199.81	198.72	197.99	195.96
23. 6 persons	199.38	196.89	194.67	193.19	189.06

[a]Subsistence level for household types 1-17: 16,081.08 DM; subsistence level for household types 18-23: 17,772.17 DM.

[b]Lower income is households with income levels of 16,000 to 18,000 DM about 80 percent of the median.

[c]Upper income is households with incomes 1.5 times the median or 34,000 DM.

TABLE 7B

ELES: EQUIVALENCE SCALES FOR FOR UNITED STATES

Household Type	Reference Income Level (in U.S. dollars)				
	Subsistence[a]	Lower[b]	Median	Mean	Upper[c]
Single					
1. all	93.60	93.40	93.03	92.71	92.54
2. aged 18 to 64	100.0	100.0	100.0	100.0	100.0
3. aged 65 or over	85.11	84.41	83.12	81.99	81.39
Single Parent, Aged 18 to 64					
4. and 1 child	106.22	106.22	106.23	106.23	106.23
5. and 1 child, aged 0 to 6	94.44	94.49	94.59	94.67	94.71
6. and 1 child, aged 7 to 17	110.57	110.55	110.51	110.47	110.45
7. and 2 children	111.47	111.44	111.37	111.32	111.29
Married Couple					
8. all	158.71	158.67	158.59	158.52	158.48
9. both aged 18 to 64	168.98	169.10	169.31	169.49	169.59
10. both aged 65 or over	139.21	138.39	136.88	135.57	134.86
11. one aged 18 to 64/one aged 65 or over	154.10	153.93	153.63	153.36	153.22
Married Couple, Both Aged 18 to 64					
12. and 1 child	171.33	171.47	171.72	171.94	172.05
13. and 1 child, aged 0 to 6	163.43	163.62	163.96	164.26	164.42
14. and 1 child, aged 7 to 17	179.56	179.63	179.77	179.89	179.95
15. and 2 children	176.42	176.54	176.76	176.94	177.05
16. and 3 children	182.96	183.03	183.15	183.25	183.30
17. and 4 children	185.31	185.34	185.40	185.45	185.48
18. 1 person	100.00	100.00	100.00	100.00	100.00
19. 2 persons	148.93	149.03	149.15	149.25	149.30
20. 3 persons	178.47	179.27	180.23	181.07	181.52
21. 4 persons	196.19	196.97	197.91	198.73	199.17
22. 5 persons	199.02	199.64	200.40	201.05	201.40
23. 6 persons	199.37	199.41	199.45	199.49	199.51

[a]Subsistence level for household types 1-17: $7,000; subsistence level for household types 18-23: $7,200.
[b]Lower is 80 percent of the median.
[c]Upper is 150 percent of the median.

in equivalence scales by household type are discussed in the next section, where we compare our results with the results presented in the literature.

Comparing Equivalence Scales

Buhmann et al. (1988) present equivalence scale sensitivity estimates across ten countries using the Luxembourg Income Study (LIS) data base. With different methods they focus on international comparisons using various types of equivalence scales for each of four types of general methods: consumption, expert program, expert statistical, and subjective. They present a wide range of results. We will demonstrate a comparison of our results to discuss in particular differences which are due to selected methods of measurement in Germany and in the United States.

Consumption Based Results

The market basket ELES approach produced the set of equivalence scales found in Table 8. Since the ELES equivalence scales do not really vary according to the income level, a natural level to be taken is the arithmetic mean of the sample's household net income. Comparing the German and the United States ELES approaches, we find that the household size values (Table 8, lines 18-23) are in fairly close concordance. Overall, the maximum pattern of differences by household size alone is 5 percent or less. Among various age and child groups the differences show a consistent pattern by group; United States values for single parents (lines 3-7) are lower, while for couples without children (lines 8-11) they are higher. United States aged couples (line 10) have the highest relative value, where the United States results are 36 percent above the German results. The next step is to compare these methodologically consistent equivalence scales to other types employed in the literature.

TABLE 8

COMPARING EQUIVALENCE SCALE RESULTS FOR GERMANY AND THE UNITED STATES, 1986-1987

Household Type	ELES		
	Germany[a]	United States[b]	Difference[c]
Single			
1. all	97	96	99
2. aged 18 to 64	100	100	100
3. aged 65 or over	76	80	105
Single Parent, Aged 18 to 64			
4. and 1 Child[b]	112	104	93
5. and 1 Child, Aged 0 to 6	104	95	91
6. and 1 Child, aged 7 to 17	116	110	95
7. and 2 Children[b]	123	109	89
Married Couples			
8. all[a]	144	166	115
9. both aged 18 to 64	149	173	116
10. both aged 65 or over	100	136	136
11. one aged 18 to 64/ one aged 65 or over	126	156	124
Married Couples, Both Aged 18 to 64			
12. and 1 child[b]	161	177	110
13. and 1 child, aged 0 to 6	153	168	110
14. and 1 child, aged 7 to 17	165	183	111
15. and 2 children[b]	172	182	106
16. and 3 children[b]	184	186	101
17. and 4 children[b]	195	190	97
18. 1 person	100	100	100
19. 2 persons	148	149	101
20. 3 persons	173	181	105
21. 4 persons	189	199	105
22. 5 persons	198	201	102
23. 6 persons	193	200	104

[a]ELES Germany: at mean of reference income level based on Tables A3 and A4.
[b]ELES United States: at mean of reference income level based on Tables B3 and B4.
[c]Difference is (United States/Germany) • 100.

Alternate Equivalence Scales

Different types of German and United States equivalence scales are widely used in each nation. In each case different groups have applied each of the different methodologies at different times to reach a set of results. We present four specific sets of comparisons here: one each for the subjective and expert statistical scales methods, and two expert program scales—one used primarily for families with children, the other for the elderly (Table 9).

We begin by comparing the subjective scales derived from answers to the "minimum income question" (MIQ). Here families were asked the minimum amount after taxes which the government by means of a social security system, should provide for their household if they had no other income. The German results are taken from a European survey as reported in van Praag et al. (1982). The United States results were obtained by deVos and Garner (1991). The results are presented for each scale and the difference between them expressed as the ratio of the United States to the German amount. Results were produced by household size alone for Germany, and for household size and age in the United States. At the bottom of Table 8 (lines 1-6), we see that the United States results are consistently larger than the German results by a factor of 19 to 36 percent.

The second and third set of scales for Germany are those implicit in their Social Assistance Regulations. These scales have also been used as German poverty line equivalence scales by the OECD and by German researchers (Hauser and Nouvertne, 1980; and Hauser and Fischer, 1986). Thus, one German scale is used for both programmatic (social assistance) and statistical (poverty) uses. The comparison scales for the United States came from the official poverty line for the statistical scale (U.S. Bureau of the Census, 1989) and from the national median benefit levels for the AFDC program in the United States for the programmatic scale (Green Book, 1992). In contrast with the subjective scales, the expert program and statistical

TABLE 9

COMPARING EQUIVALENCE SCALE RESULTS: SUBJECTIVE AND EXPERT SCALES FOR GERMANY AND UNITED STATES, 1983

Household Type	Subjective Scales			Expert Program Scales, Social Assistance:		
	Germany	United States	Difference	Germany	United States	Difference
Single						
1. all	100	100	100	100	100	100
2. aged 18 to 64	100	106	106			
3. aged 65 or over	100	84	84			
Single Parent, Aged 18 to 64						
4. and 1 child	120	143	119	161	144	89
5. and 1 child, aged 0 to 6				145	144	99
6. and 1 child, aged 1 to 17				171	144	84
7. and 2 children				222	174	78
Married Couple						
8. all				180	144	80
9. both aged 18 to 64				181	144	80
10. both aged 65 or over	120	146	120			
11. one aged 18 to 64/one aged 65 or over						
Married couples, both aged 18 to 64						
12. and 1 child	135	172	127	242	174	72
13. and 1 child, aged 0 to 16				226	174	77
14. and 1 child, aged 7 to 17				252	174	69
15. and 2 children	145	195	134	303	203	67
16. and 3 children	154	211	137	364	236	65
17. and 4 children	162	193	119	475	270	64
Household size						
18. 1 person	100	100	100	100	100	100
19. 2 people	120	143	119	181	144	80
20. 3 people	135	172	136	242	174	72
21. 4 people	145	195	127	303	203	67
22. 5 people	154	291	134	364	236	65
23. 6 people	162	193	119	425	270	64

TABLE 9 (CONT.)

Household Type	Expert Statistical Scales, Poverty: Germany	United States	Difference	Expert Program Scales, Social Retirement: Germany	United States	Difference
Single						
1. all	100	100	100	100	100	100
2. aged 18 to 64	100	102	102			
3. aged 65 or over	100	94	94			
Single Parent, Aged 18 to 64						
4. and 1 child	161	135	84	133	na	
5. and 1 child, aged 0 to 6	145	135	93			
6. and 1 child, aged 1 to 17	177	135	79			
7. and 2 children	222	158	71	167	na	
Married Couple						
8. all	180	128	71	167	150	90
9. both aged 18 to 64	181	132	73			
10. both aged 65 or over	180	119	66			
11. one aged 18 to 64/one aged 65 or over						
Married couples, both aged 18 to 64						
12. and 1 child	242	158	65	200	nc	
13. and 1 child, aged 0 to 16	226	158	70			
14. and 1 child, aged 7 to 17	252	158	63			
15. and 2 children	303	199	66	233	na	
16. and 3 children	364	235	65	267	na	
17. and 4 children	475	263	62	300	na	
Household size						
18. 1 person	100	100	100	100	100	100
19. 2 people	181	128	71	167	150	90
20. 3 people	242	157	65	200	na	
21. 4 people	303	201	66	233	na	
22. 5 people	364	238	65	267	na	
23. 6 people	425	268	63	300	na	

Source: German from Van Praag, et al. (1982); U.S. from DeVos and Garner (1991); German Social Assistance (De Bundesmunster, 1990); median state AFDC benefits (Green Book, 1992); German Social Assistance, same as c; U.S. Poverty line matrix from U.S. Bureau of the Census (1989); German Social Retirement (der Bundesmunster, 1990); U.S. Social Security Administration (Green Book, 1992); Difference is (USA/Germany) = 100.

scales for the United States are less than those for Germany for each household size. In other words, the additional costs of extra household members (children or adults) beyond the first member are implicitly much higher in Germany than are the additional costs in the United States. United States values are from 64 to 80 percent of German "program" values and 63 to 71 percent of German "statistical" values. Moreover, the difference increases systematically with household size.

The importance of these differences cannot be minimized. Essentially they say that if a single person "needs" $100 a month to be nonpoor or at a social assistance/AFDC guarantee, four persons need $303 in Germany and only $201-$203 in the United States—a full one-third difference. The impact of these differences on poverty measurement or income adjusted for differences in household size is enormous. If each country uses its "own" scale in these cases, the income requirements of larger size households will be consistently larger in Germany as compared to the United States. This is of particular importance in studies which compare the economic well-being of children relative to older people in the two countries. Because children live on average in larger households than older people, the smaller the returns to scale, the relatively worse off children will appear. The German scale will make children appear much worse off relative to the American scale. Because their method of calculations is not held constant, it is difficult to decide which—if either—of these scales is most appropriate for cross-national comparisons.

The final set of scales uses the German and United States implicit scales for social retirement. The only major category for retirement benefits in the United States is for aged couples versus individuals (single, widows, or widowers, survivors or retirees per se). Here the difference between the scales is only 10 percent, much closer than the other United States/German couplings, but still significant. For instance, Smolensky et al. (1988) found that

the difference between the United States social retirement scale and United States poverty line scale produced a 22 to 33 percent difference in poverty rates among single elderly women in the United States.

International Equivalence Scale Approaches

The German-U.S. comparisons can be further expanded to cover types of equivalence scales used in the cross-national comparative literature on poverty and income inequality. While the range of scales in use is wide, four recent studies have used a set of equivalence scales which are almost identical. Represent equivalence scales as some power parameter for which household size is raised, i.e., as in Buhmann et al. (1988), recent studies on poverty for the United States (Ruggles, 1990), for the OECD (Forster, 1993), and for the European Commission (Hagenaars, Zaidi and de Vos, 1992), and on income inequality for OECD (Atkinson, et al., 1993) all used formulae which resulted in a household size coefficient of $\varepsilon = .5$. Table 10 compares this common international equivalence scale to the ELES scales produced in this report. The differences are large, for both United States and Germany at larger household sizes, and for United States alone at smaller sizes.

Concluding Remarks

Our equivalence scale study based on actual consumption expenditure microdata using the constant utility based ELES approach provides a variety of interesting results with regard to different household composition effects in both countries. Additional discussion and examination of specific groups, e.g., older people married couples and single mothers, and children are clearly in order. The results differ from those scales which are implicit in the German social political discussion and Social Assistance Regulations and within the United States social welfare system. Because our equivalence scales are behaviorally based on broad

TABLE 10

COMPARING EQUIVALENCE SCALE RESULTS FOR GERMANY AND THE UNITED STATES WITH A COMMON INTERNATIONAL SCALE

Household Type	Germany[a]	United States[b]	Common International Scale[c]
Household size			
18. 1 person	100	100	100
19. 2 people	148	149	141
20. 3 people	173	181	173
21. 4 people	189	199	200
22. 5 people	198	201	224
23. 6 people	193	200	245

[a]ELES Germany: at mean of reference income level based on Tables A3 and A4.
[b]ELES United States: at mean of reference income level based on Tables A3 and A4.
[c]Common International Scale (see text).

and representative samples in both nations, these results should be considered in the respective social political discussion, in both countries.

Our results lead us to believe:

1. Comparing the ELES German with United States results, differences in cross-national results from our ELES scales appear to be much smaller than do the results from other pairwise similar approaches.

2. Because there are differences in each couplet of approaches, particularly for the nonregression based results in Table 9, one might expect that using the "same genre" of scale, e.g., German Social Assistance for Germany, and United States Social Assistance or poverty for the United States, would produce different results. Recent research by Burkhauser et al. (1991) indicates that this is the case. In fact, a large amount of the motivation for this project derives from the differences which such choices make in policy relevant results.

3. Substituting one "international" equivalence scale across a couplet of other approaches (Table 10) is liable not to solve many problems. While some "average" scale will be between outlier estimates, the average will still be far from the two poles.

4. The ELES results which apply the same methods and market basket data are based on identical methodologies but produce slightly different results when only household size is considered, and larger differences by age and other characteristics.

5. When compared with a common international comparisons scale, the differences are much larger than between the United States and German ELES scales produced here.

In the future we intend to compare our scales to other international and national approaches. But we expect that, given the alternatives, an approach which holds method constant and which makes the underlying data as comparable as possible is the best approach to follow.

Endnotes

1. Two recent surveys on equivalence scales and their uses in inequality and poverty measurement, Coulter, Cowell, and Jenkins (1992), and Buhmann et al. (1988), divide the topic into five categories: econometric, subjective, budget standard, social assistance, and programmatic equivalence scales. Pollak and Wales (1979) in general discuss welfare comparisons and equivalence scales. For further recent equivalence scales overviews, for example, see Klein (1986, 1990), and Bradbury (1992b).

2. The resulting identification problem of calculating (n) good specific scales and one general scale out of information from (n) available goods can be approximated by exogenously setting one scale or by iterative solutions (Singh and Nagar, 1973; McClements, 1977).

3. Seel and Hartmeier (1990) estimate household production based equivalence scales to develop standard times for household activities.

4. The identification problem here is solved by the following Barten's (1964) approach to incorporate household characteristics in a demand system (Kakwani, 1977).

5. Since A is independent of the household characteristics, the inverse of A, A^{-1}, only needs to be computed once to calculate all s vectors d_k giving the household composition influence for the entire expenditure system by $D_{(ns)} = (d_1,...,d_s)$.

6. The FELES approach by Merz (1993a), is functionalizing important ELES parameters by socio-demographic factors. Computations with a single variable "household size" define proportional effects, which however, should be revealed by the analyzed behavior and not by a given functional form. Van der Gaag and Smolensky (1982), for example, take log of family size in their overall (ELES) regression specification.

7. Another general possibility to incorporate the household composition is to run separate regressions for separate subgroups given by each household type (see Merz, 1980, pp. 60-62.

8. The opportunity to use this unique microdata base as provided by Professor Dr. R. Hauser, University of Frankfurt and by German Federal Statistical Office, Wiesbaden.

9. The results for food therefore have to be similar to the above Engel approach. However, because the system approach requires a subsample with all categories' expenditures *and* household income > 0, the sample size and thus the estimated coefficients will differ.

10. Consisting of voluntary social security contributions, other income transfers (gifts, automobile tax, other taxes, garden rent, etc.), wealth accumulation expenditures (expenditures for society building deposits, shares, savings), and mortgage payments, interests, etc.; for details, see Statistisches Bundesamt (1983).

11. The common utility level for the reference household as well as to the household of specific interest is chosen to be $u = u_0$ with the characteristics of the reference household. Pollak and Wales (1979) and Blundell and Lewbel (1991) stressed the point that any utility based equivalence scale is not unique because of the utility function transformation properties. Blackorby and Donaldson (1991) show how unique scales can be determined.

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